



PowerFilm and Researchers Work Together to Advance Solar Cells

It's no surprise that PowerFilm is collaborating with Iowa State University on research that could impact the efficiency of solar cells. The Ames company, established in 1988 as Iowa Thin Films, has strong ties to the university.

In the 24 years since its founding, PowerFilm has become a world-leading developer and manufacturer of thin, flexible solar modules using a proprietary low-cost production process. Products include everything from portable and rollable solar chargers to solar panels that are integrated with building materials to offer an alternative power source direct from the structure.

Cofounder Frank Jeffrey first did research on solar energy, specifically amorphous silicon, with Ames Lab physicist and Iowa State professor Howard Shanks while working on his PhD in physics at Iowa State. It was the late 70s, and researchers were just beginning to use amorphous silicon in the photovoltaic devices that convert sunlight directly into electricity.

When Jeffrey and colleague Derrick Grimmer later launched the start-up company, they subcontracted with Iowa State for research by Shanks and Professor Vikram Dalal at the Microelectronics Research Center to further develop and improve the solar cells they wanted to manufacture and sell.

Today, Kristen Constant and others on the Iowa State photonics research team (Kai-Ming Ho, distinguished professor of physics and astronomy, and Sumit Chaudhary, assistant professor of electrical and computer engineering) are working on photonic band gap materials, which are structures that manipulate light.

"We are trying to design and build structures that have interesting properties," says Constant, professor and chair of

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On the Cover: PowerFilm employee Karen Dreke prepares solar panels for processing.

CIRAS Mission: Every day we will enhance the performance of industry through applied research, education, and technical assistance.

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FEA Services Help Companies Achieve Success

CIRAS provides a wide range of services and resources to help manufacturing companies improve their products. One area of expertise is in Finite Element Analysis (FEA).

Finite Element Analysis is a technique used to predict responses of structures and materials to environmental factors such as force, heat, and vibration, according to John Roberts, CIRAS project manager. The process starts with the creation of a geometric model, which is then divided into smaller shapes connected at specific nodal points. In this manner, stress-strain relationships are more easily approximated. Finally, the material behavior and boundary conditions are applied to the model and the analysis is performed.

Benefits of implementing FEA include speeding up development of new products, improving quality, assisting with development of testing processes, and allowing for examination of "what if" design scenarios. Two companies who have used CIRAS as an FEA resource are Hadar Athletic in Humboldt and Precision Pulley and Idler (PPI) in Pella.

Hadar Athletic was started in 1960 when two Iowa high school football coaches—Al Hadar and Norman Wolters—opened a small shop to produce an indoor shot put. It was an idea that Hadar had been developing since 1955.

Today the company, under the leadership of Al's children—Mary Hadar Miner, Joe Hadar, Jim Hadar, and Wayne Miner—manufactures a wide range of athletic equipment including everything from football practice dummies to gymnastics and wrestling mats. Hadar Athletic's introduction to FEA actually grew out of a testing project that was initiated when a junior blocking sled the company manufactures was found not to be performing to the company's expectations.

"We emphasize that FEA doesn't eliminate the need for engineering calculations and testing. It does, however, add confidence in the results and hopefully reduces the number of times that you have to go through and make design changes and test to ensure a structure is adequate."

—John Roberts

Joe Hadar, director of research and development, called on CIRAS for assistance. "We had a fairly good idea how to solve the problem with a change to our manufacturing process," he explains, "but we wanted to be 100 percent certain, and that required testing we didn't have the in-house resources to do."

Having worked with CIRAS previously on product development issues, Hadar called Brenda Martin, CIRAS account manager. He described the problem and potential solutions, and that led to a meeting with Roberts.

Roberts coordinated testing the L-bars—the plates used to mount the dummies to the sled—made using the current manufacturing process and the L-bars made using the alternative method to compare the results. Discussion of the results led Hadar Athletic to change its process.

"The change we implemented eliminated factors that led to reduced product performance, and we haven't had any failures in the last two years," Hadar says. He



At Hadar Athletic, Jon Christensen places a flat L-bar blank into the press.

estimates changing the process helped the company increase sales by \$100,000 and retain sales of another \$100,000.

In the course of the testing, Hadar raised another question about whether or not the rear attachment of the L-bar to the sled affects the stress experienced in the L-bar. "We wanted to optimize the bolt placement, and Roberts suggested running a Finite Element Analysis comparison to help us accomplish that," Hadar says.

"We modeled the plate with two restraints, as they were currently doing, and ran the analysis looking at the stress distribution," Roberts explains. "We then modified the model with just one restraint at the location where it would be mounted. The analysis was run again and compared to the results from the previous one, and we provided that information to the company."

Work on the blocking sled is continuing. "I think we will discover unique aspects of the loading forces that will improve our models and our designs," Hadar says. He adds that he will be following up with Roberts to talk about FEA software and

what the company might do to bring FEA on-site to improve their own engineering capabilities.

PPI Benefits from CIRAS FEA Expertise

Precision Pulley and Idler, headquartered in Pella, has four plants in both Pella and Corning as well as one plant in Lenox. Established in 1977, PPI designs and manufactures some of the largest conveyer pulleys used in copper, coal, and iron ore mines around the world. Working with Tom Rudolphi, an Iowa State professor in aerospace engineering, PPI first developed their own FEA program in 1997. They spent a year developing the program and another year verifying it, according to Leo Laughlin, product engineering manager.

"Normal equations don't work for conveyer pulleys because they make too many assumptions as far as parts being fixed," Laughlin explains. "Typically you think of the outside of the disc being fixed and something being applied to the hub. In this case, however, the outside is a rim, and it undergoes pressures causing it to move slightly. If you don't take that into account, you're going to have problems. The only way to get an accurate design is with FEA."

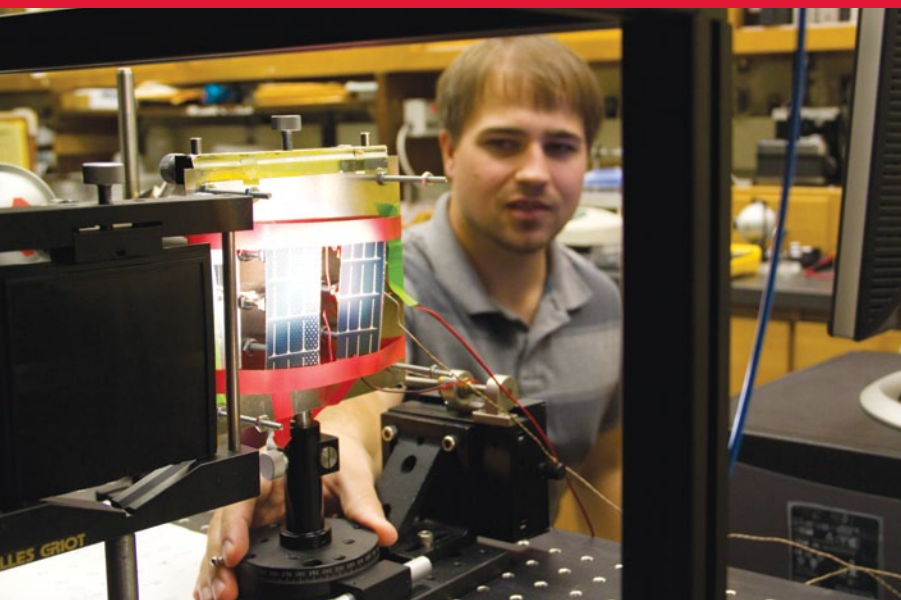
Due to the size and complexity of PPI's pulleys, Laughlin contacted Roberts at CIRAS in 2009 for some additional assistance. "They wanted to compare their results to the full 3-D solution that we generated using our software," Roberts says.

"The analysis told us our model is right, where it matters" Laughlin adds, "and where it is a little bit off, it doesn't affect the quality of the product. Our goal is to get the longest life for our products for the least amount of dollars, and CIRAS is helping us do that."

Finite Element Analysis is a great tool to help companies get closer to their goal in a shorter amount of time, according to Roberts. "We emphasize that FEA doesn't eliminate the need for engineering calculations and testing. It does, however, add confidence in the results and hopefully reduces the number of times that you have to go through and make design changes and test to ensure a structure is adequate."

Roberts encourages companies that want to learn more about FEA and how it might be used to their benefit to contact CIRAS. "Our goal is to educate Iowa manufacturers about the technology and help them make decisions about whether to bring FEA in-house or to work with an engineering consultant," he explains. "We demonstrate the program to help them understand how it can be used to improve their products."

➤ For more information, contact John Roberts at 515-294-0932 or jarobert@iastate.edu.



Left: Ryan Gebhardt, graduate student in materials science and engineering, studies one of PowerFilm's solar cells.

Right: Easily identifiable labels are key to maintaining high-quality control standards.

the Department of Materials Science and Engineering (MSE). "Some of these structures are transparent and actually reject heat. You can imagine the value of having a film on a window that keeps whatever temperature you have inside, whether it's hot or cold. That would make a highly efficient window. When we realized that was a potential for these structures, we started looking at who we could engage from an industry point of view to work with us."

The research is largely funded by the Department of Energy (DOE) through Ames Lab. The DOE funding does not address specific applications for companies, so Constant sought CIRAS' assistance to help begin to bridge the gap between the lab research her group was doing and something that could eventually roll off the production line.

CIRAS often facilitates the relationship between industry and researchers, according to Mike O'Donnell, CIRAS Manufacturing Extension Partnership associate director. "Usually," he says, "the university/industry collaboration happens the other way around with companies contacting CIRAS with an idea, and then we find a faculty member to conduct the research."

Recognizing the challenge for Constant's group to obtain government funding at this early stage of development and the potential benefits to a company like PowerFilm, CIRAS agreed to support Ryan Gebhardt, an MSE graduate student, to work on the project.

Dan Stieler, senior physicist at PowerFilm, is excited about the project and what it means, both for his company and for the researchers. "Our goal is to make the solar cells produce more energy," he says. "Iowa State has the analytical equipment to help us determine the best way to do that. Ryan makes the actual patterns and gets everything prepared, then we run it through our equipment. We have the expertise in the processing of it. It then goes back to Ryan for analysis. It's great to be able to bounce ideas off each other."

Working with a commercial company was really essential in order to proceed, according to Constant. "We have learned how to make these structures, and they actually perform quite well and show a lot of potential, but we aren't able to do scale-up. Our lab-scale specimens aren't very useful when you're talking about solar panels or coatings on windows."

The project, which started in August of 2011, has three parts. Each part uses a variation of the structure designed and fabricated by Constant's research group in a different application.

The first area is to texture the substrate used in solar cells to increase the amount of light absorbed, thus improving efficiency. The challenge is determining whether or not the polymer structure can withstand the thermal conditions of PowerFilm's processing and then how much the efficiency can be improved.

The second part focuses on the structure working as a heat mirror. A heat mirror rejects infrared radiation, resulting in a lower operating temperature and higher efficiency for the solar cells.

The third application involves the scale-up of the transparent electrode structure. The goal is to increase the conductivity of the film with minimal losses in light transmission.

Constant is pleased with the progress thus far. "Some of it has been very promising, but almost all of it leads to other questions," she says. "We were trying to take our structure and figure out how to scale it up, but when we

realized what the constraints were in the manufacturing process, we built some slightly different structures that still performed okay. It's really become a nice hybrid, a melding of the two technologies."

PowerFilm has also worked with undergraduate industrial technology students in the Department of Agricultural and Biosystems Engineering (ABE). In the fall of 2010, Jacquelyn Baughman, a lecturer in ABE, was looking for projects that would help her students gain hands-on experiences in lean management and facility planning.

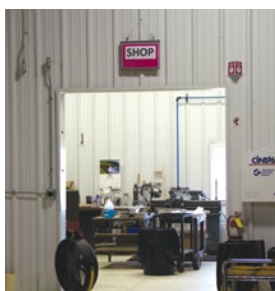
At the time, PowerFilm had been in a new facility for about a year and wanted some assistance in the areas of Lean manufacturing and plant layout. "Bringing students in for projects gives them good experience tackling a problem and allows us to move the ball forward on things that are important but not necessarily our highest priority," says Pat Rundall, vice president of operations.

Each student team met with PowerFilm representatives to discuss potential projects. After further discussion back in the classroom, the teams developed a charter that outlined the scope of the project and how they would work on it. Once students and the client signed the charter, the students carried out the project. At the end of the semester, the teams made a final presentation to the client with an explanation of the work they completed and their recommendations.

"The ultimate goal," Baughman says, "is to have a positive impact on the company's bottom line and for the students to develop professionally in workplace competencies including customer satisfaction, analysis and judgment, communication, initiative, continuous learning, and teamwork. Working directly with clients in industry is an invaluable experience for students. It gives them the opportunity to apply knowledge and skills they've learned in the classroom to real-life situations."

The projects were successful from PowerFilm's perspective as well. The teams helped better organize the plant layout and update floor plans. In addition, new signage was built to hang from the ceilings so it's easier for people to see which functional area they are going into.

"Overall it was a good experience," Rundall says. "Being able to tap into the students' creativity has helped us move forward on some issues, and working with Jackie and challenging the students to think about some of the projects from a different perspective has been very rewarding."



Kristen Constant is an Iowa Stater through and through. A graduate of Clarke Community High School in Osceola, she headed to Iowa State in 1982 as an undeclared engineering

student. She chose ceramic engineering when she discovered that the field would give her the opportunity to combine her interests in both materials and electronics.

A successful undergraduate career and the encouragement of faculty members to consider graduate work led Constant to Northwestern University. After earning a PhD in materials science and engineering, she moved to Boston for a postdoctoral appointment at the Massachusetts Institute of Technology.

Just five-and-a-half years after earning her BS at Iowa State, Constant returned to Ames as an assistant professor in the Department of Materials Science and Engineering (MSE). She chose Iowa State over industry and other institutions because of its land-grant mission of teaching, research, and service as well as the connection to the Department of Energy's Ames Laboratory. "To top it off," she says, "Iowa State was home."

Constant is now a professor in MSE with a research focus on photonic materials fabrication, finding more effective and efficient ways to create novel crystal nanostructures for optical and energy applications. In addition, she began a new role as chair of MSE on July 1 of this year.

One of Constant's priorities as chair is to reach out to industrial partners. "Collaborations with industry are win-win all around," she says. "Most industries can benefit from the materials expertise our faculty have. As with the PowerFilm project, these kinds of relationships enable us to expand our research beyond what we can do in the lab and help companies advance their products and processes. In addition, working with companies who hire our graduates will help us better prepare students to meet industry needs. We have an extraordinary student body, and we want to give them as many different opportunities as possible."

➤ **For more information, contact Mike O'Donnell at 515-294-1588 or modonnll@iastate.edu.**

Worksite Wellness Programs—Good for Business



What comes to mind when you hear the phrase “worksite wellness programs?” The phrase is often associated with activities like exercise and nutrition classes, but these represent just one aspect of worksite wellness programming, according to Ruth Litchfield, associate professor of food science and human nutrition at Iowa State University.

“Effective worksite wellness programming should consist of three levels,” says Litchfield, who is working with CIRAS through the Economic Development Administration University Center (EDAUC) program. Together they are developing pilot wellness programs at three Iowa companies. “The first level is designed to make employees aware of how habits and lifestyle impact their health and well-being,” she explains. “Things like nutrition, physical activity, financial health, and stress can all impact how people perform in their jobs and their daily lives, but people won’t make a behavior change unless they first realize there is an issue.”

Level two focuses on helping employees identify behaviors they want to change and develop strategies for successfully modifying those behaviors. This level includes educational programs on topics ranging from heart disease prevention to parenting skills to financial management; fitness programs, which include things like on-site activity programs or discounts at local fitness centers; and access to resources designed to help employees in such areas as stress management, planning for retirement, or preparing healthy meals.

The third level targets promoting wellness through policy or environmental changes; for example, businesses might look at what types of beverages and snacks are available to their employees and whether or not they are providing healthy choices. Putting up signs to encourage taking the stairs and ensuring that the stairwells are clean and inviting are easy ways to make a difference. Employers can also provide space and equipment such as exercise machines, bicycles, or ping pong tables to promote physical activity during breaks.

With frequent news coverage about the obesity crisis and its consequences such as type 2 diabetes, hypertension,

cardiovascular disease, and joint replacements, the concept of worksite wellness programs is gaining momentum. And while the expense of a worksite wellness program could be cited as an excuse for not offering one, Litchfield asserts that wellness programs really are good for business.

“Studies indicate that a company will gain \$2–\$5 on every dollar spent on wellness programs,” Litchfield says. “That return on investment (ROI) takes three to five years, however, so it does require patience to benefit from the results.”

The ROI comes in different forms. These include increased employee productivity due to improved morale as well as reduced absenteeism and presenteeism. The latter is a new term assigned to employees who show up for work but don’t perform at their best because of a health issue, chronic pain, or stress related to personal issues such as financial problems. It is estimated that absenteeism and presenteeism cost companies two to three times more than actual health care costs.

Studies have shown wellness programs reduce health care expenses by 26% and absenteeism by 28%, according to Litchfield. “The lower costs come from decreased health care usage, including physician visits and medical procedures, with the biggest savings found in having fewer hospitalizations,” she says. “In addition, prescription drug claims for antianxiety, antidepressant, hypertension, type 2 diabetes, and cholesterol-lowering medications are lowered.”

Recognizing these potential benefits, CIRAS initiated a project at three worksites this past summer to determine how companies could best be assisted in implementing holistic wellness programs that include both physical and financial health. “We saw a gap among companies in the social aspect of the triple bottom line assessment (financial, social, and environmental),” says Mike O’Donnell, CIRAS EDAUC program director. “This effort is designed to help fill that gap.”

With the goal of developing a customized wellness program for each site, Litchfield and Tim Griesdorn, assistant professor of human development and family studies, began the project with an online survey of employees. The survey was designed to provide demographic information as well as insights into the employees’ perceived needs and concerns. This was followed by focus groups of 8–10 employees at each site to further understand the results of the surveys. Focus groups are also being conducted with administrators at each site to get their input.

Sixty employees (self-selected) from each site will receive a health-risk appraisal. This includes such things as fitness assessment, body composition, height, weight, and blood pressure, as well as meetings with health and financial

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TWI Focuses on Learning by Doing

CIRAS industrial specialist Jeff Mohr likes being a teacher and a coach. And that is exactly what he does as a certified trainer for Training-Within-Industry (TWI), which is a set of learning disciplines and problem-solving tools in the areas of job instruction, job methods, and job relations.

Mohr was working with Iowa companies, helping them develop Lean skills such as value streaming and Kaizen, when he noticed something was missing. “A key component in Lean manufacturing is basic stability, which gets you to the point where you have predictable resource availability and predictable processes,” he explains. “Until people do things the same way every time, stability is not going to happen. Managers would say they had documented standards, but as I observed on the shop floor, I could see everybody wasn’t doing the job in a standardized way.”

Mohr’s introduction to TWI came when he attended a session on the job instruction module at a conference. He saw it as a tool CIRAS clients could use. After learning more about the program, he went through the classes to become a certified trainer for the program that emphasizes learning by doing. CIRAS began offering TWI to its clients in 2007.

Each of the modules—job instruction, job methods, and job relations—is presented in five two-hour sessions held during one week. The format consists of instruction and discussion of steps to follow to achieve the module’s specific goals.

Job instruction, for example, is aimed at training employees how to do a job safely and proficiently. It includes developing a systematic way to provide and document training. Job methods instructs supervisors on how to improve work processes and procedures by studying all aspects of the job to determine the best way to do it. Job relations focuses on leadership development, working out problems, and treating people fairly.

The participants spend the remaining four sessions working in teams applying the methods they learned the first day to a variety of current situations in their workplace.

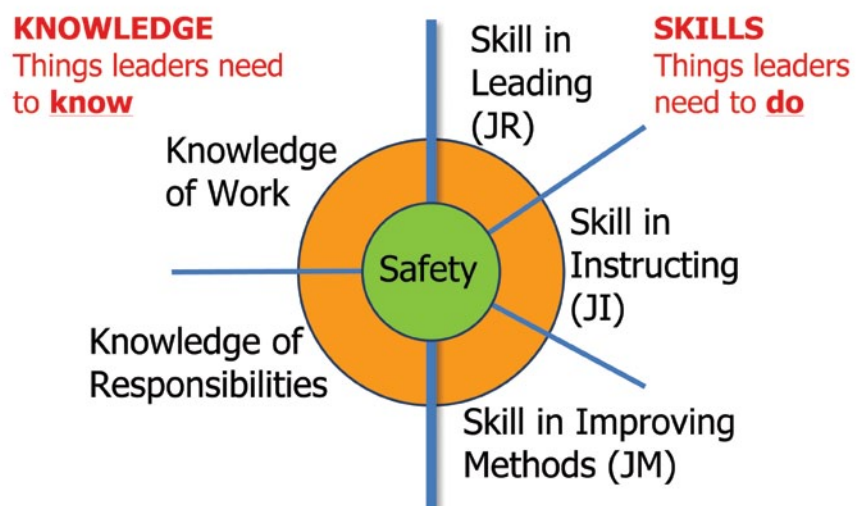
The opportunity to practice the process is what makes TWI so valuable, according to Michael Hansen, quality and Lean systems manager at Warren Distribution in Council Bluffs, Iowa. “We’ve had training before, and it all sounds great, but if you don’t apply what you’ve learned right away, it is very hard to implement it when an issue comes up,” he says.

Forty employees from Warren’s production and distribution centers in Council Bluffs participated in job relations TWI sessions held in September 2011 and January 2012. Since the training, groups of 10 have met regularly to review the process, discuss issues, and generally support each other.

Hansen says the company is waiting for more information before they can quantify the impact, but positive effects are already surfacing. “In talking to the leaders who participated, they feel it has helped them be better managers and supervisors and that morale has improved.”

For Mohr the rewards of TWI revolve around helping people develop as leaders. “I get excited about the whole concept of developing people by helping them apply new principles and acquire new skills. A key aspect of Lean is respect for people. The way we demonstrate that isn’t just through being polite and fair but also through coaching the development of new skills and challenging them to do things that they may not have realized they could do. Through TWI, CIRAS is able to help employees do that.”

5+ Basic Needs of Good Workplace Leaders



A key aspect of TWI is developing strong leaders.



Decker Manufacturing Redefines Success

A leader in the agricultural products industry for more than 130 years, Decker Manufacturing is known for its high-quality products and customer service. And while Decker's history is strong, Marty Fox, president, knows that innovation is the way to keep the company growing and maintain its competitive edge.

Innovation Starts with Education

Last fall, Fox attended a CIRAS-led workshop that introduced the Sustainable Economies Program. The program helps a region and its economic drivers grow sustainably through managing the triple bottom line: financial, social, and environmental. With knowledge gleaned from the workshop and a desire to learn more, Fox contacted Mike O'Donnell, at CIRAS.

O'Donnell and CIRAS project manager Jim Poe met with Fox and started work on a sustainability assessment for the company. The focus on the triple bottom line allowed the company and CIRAS to have a discussion on all aspects of the company and identify opportunities to improve long-term growth.

Short-Term Goals Set in Motion

Several short-term goals were immediately identified. First, there was a need for floor space planning. "We had to work within the confines of the existing building," explains O'Donnell. "In order to create capacity for growth, Decker needed to organize its work space to gain greater efficiency."

CIRAS suggested starting with a Lean manufacturing tool, 5S, to organize the plant. The 5S process centers on the following ideas: sorting, setting in order, shining, standardizing, and sustaining. "The goal is to have the proper paperwork, tools, and equipment in the right place, so the team can work more efficiently in their space," explains Poe.

The 5S process relies on employees taking control of their work areas and implementing improvements. "The results of this process were amazing," says Fox. "We started on the press room and the tool shop and have made great strides already."

An improved inventory control system has started as well. Decker recently rented new warehouse space where raw



materials are shelved and clearly labeled with placards for easy identification.

With help from the CIRAS team, Decker applied for a grant to purchase new inventory control software. "We have made big inroads with inventory control already, but a new automated system with bar code readers will bring everything up to date," says Fox.

Decker also investigated the benefits of outsourcing their high-volume brush blocks versus manufacturing them in-house. They determined that local outsourcing in this case made financial sense. "We are now working with a manufacturer located in Mount Pleasant to purchase this product," says Fox. "At a savings of 3¢ to 5¢ per block with 20,000 blocks each delivery, it's a win/win opportunity."

Decker Realizes Greater Profits

Implementation of these near-term projects has paved the way for big

impacts. In addition to the outsourcing strategy, Fox is very proud of the other cost-recovery processes that have been put in place.

A new brush-filling machine was purchased in December. It provides double the output of the machine that was replaced, yet maintains the same floor plan footprint. Fox plans to purchase a second machine to keep up with the current sales volume.

"The Green 101 and Dumpster Dive workshops led by CIRAS have given Decker the most tangible results so far," says Fox. A metal recycling service dumpster that was installed in April has already earned \$1,700. A second load is almost ready for recycling and will provide a similar payout. Decker is now actively recycling all paper and their aluminum, brass, and copper.

With these new strategies in place, Decker Manufacturing has realized a gain of 10 percent in sales since September 2011. "The partnership with CIRAS is definitely working for us," says Fox. "Our new processes are holding prices down by reducing our costs."

Fox is quick to credit his employees for the company's success, and he values their contributions. "If it weren't for them, we wouldn't be where we are today."

The team at Decker Manufacturing continues to work closely with CIRAS. Discussions now focus on long-term goals to strengthen the company and maintain their competitive advantage in the global marketplace.

(This is part two of a two-part series. For Decker Manufacturing's history and initial steps taken while working with CIRAS, see the August 2012 issue of CIRAS News.)

➤ **For more information, contact Mike O'Donnell at 515-294-1588 or modonnll@iastate.edu.**

Lockard Companies Takes a Holistic Approach

Sixty years ago, Wendell Lockard started a small construction firm in Cedar Falls, Iowa. Using a design/build concept, he soon gained a reputation as a premier commercial contractor in the local industry. Today Lockard Companies, while still headquartered in Cedar Falls, has gone nationwide with construction and development projects (medical and manufacturing facilities, retail stores, and shopping centers) in 28 states.



Kenneth Lockard, who succeeded his father as president in 1985 and is now chairman, says Lockard Companies is a real estate solutions company. Services cover the entire spectrum from the concept stage all the way through design and construction and finally to operating the property from a management perspective.

"We take a holistic approach," Lockard explains. "The average person who walks in the door has never bought a piece of commercial ground, hired architectural or engineering firms, worked with construction firms, submitted and obtained permits from various city and state agencies, or done the analytics of putting an entire development together. We have the expertise and experience to guide them through the total process."

That approach is a key to their success, according to Robert Smith Jr., Lockard Companies president. "We don't get to build something unless the project actually happens," he says. "If we throw a project on the board that isn't fiscally responsible or can't be funded, we don't go any further. We help our partners and clients identify all of the pieces that are required to take a project from start to finish. Or, as the video on our website (www.lockardonline.com) explains, we have the expertise to serve clients at any stage during the process."

A wide range of topics is thoroughly discussed throughout the project. Lockard and Smith emphasize, for example, that value engineering of items like roofing materials and heating and cooling systems includes the installation costs up front as well as the operating costs down the road. They make sure clients are fully informed as they make important decisions and won't have unpleasant surprises once they are in the new facility.

While Lockard Companies works largely with the private sector, it also has had success winning government contracts. CIRAS' Dave Bogaczyk, program director, and Julie Fagle, government contracting specialist, have worked with the company since 2007 to guide them through the rigors of bidding on government projects. Their understanding of complex government rules and regulations and their ability to share information with clients such as Lockard Companies greatly facilitates the process.

One of the biggest government complaints is that companies don't respond to what they are asked and don't clearly state their qualifications for a job, says Bogaczyk. He and Fagle use their expertise with the process to help clients create a capability statement that is targeted to the agency requesting bids. They assert that it's not a one-size-fits-all process, and that each capability statement has to be customized to the potential client.

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James Fettkether, president of Lockard Construction, says he first worked with CIRAS on a project to build biosafety labs at Fort Detrick, a U.S. Army medical command installation in Frederick, Maryland. "There is extensive supplemental information that you have to provide before you can become a vendor," Fettkether notes. "CIRAS helped us set up our vendor identification numbers and then group the opportunities so we could review the ones that were really appropriate for us. Guidance from Dave and Julie has been very beneficial."



Biosafety labs at Fort Detrick, a U.S. Army medical command installation in Frederick, Maryland.

Fettkether, who is a member of the CIRAS Advisory Council, also credits CIRAS with helping the company understand how partnerships and joint ventures work in the bidding process. The company partnered with Art's Way Scientific on the Fort Detrick project. Located in Monona, Iowa, Art's Way Scientific has supplied custom-designed modular laboratories for agencies such as the Department of Defense and Homeland Security.

"Partnering with a team like Art's Way enables us to bring a creative solution to a government agency," Smith

says. "Leveraging the expertise and experience allows us to bring a solution that is superior both in terms of time and value for the government."

While government contracts have been limited recently due to budget constraints, Lockard is optimistic things will change as the economy improves and projects will be initiated to meet a backlog of needs.

Partnering, however, is an important part of the company's philosophy in all of its business and makes it different from other companies, according to Lockard. "When we go to a location, we become, in our view, not only a partner with whomever we're doing the project, but also with the city and really the community," he explains. "We believe it is important to find qualified subcontractors in those communities as opposed to bringing our people in. The size and scope of today's projects impact the entire community. Having them be a part of the project benefits all of us and is a form of local economic development that is unique to Lockard."

➤ **For more information, contact Julie Fagle at 319-310-8612 or jafagle@iastate.edu.**

Iowa State's WurstFest—A Smorgasbord of Sausages

For five nights in July it was all about meat at the 34th Annual Sausage and Processed Meats Short Course, featuring WurstFest at Iowa State University.

Unless you were lucky enough to get on the invite list and experience firsthand the capstone event of the program, WurstFest, it is hard to image this festive annual celebration of sausage and processed meats organized by Iowa State University's Meat Science Extension Program.

On July 19, more than 200 guests gathered at the Gateway Conference Center in Ames for WurstFest, where they sampled more than 50 different meat products that were prepared during the short course as part of the activities. The reception and dinner menu display stretched as far as the eye could see and included long-time favorites of landjager, lovecky, German salami, whiskey fennel smoked sausage, roast beef, polish sausage with cheese, smoked brisket, and smoked pork loin.

Many products were prepared by Klaus Kreibig, marketing director of product development and application at Devro PLC in Scotland. Kreibig, a master sausage maker with more than 45 years of experience in the meat industry, has traveled to Iowa State every year for more than 25 years to participate in the short course. He arrives several weeks prior to the event to prep for the course, making countless varieties of fresh, semi-dry, and fermented sausages for the week's major social event.

Attendees Come from All Around the World

WurstFest is the culmination event of the Sausage and Processed Meats Short Course held July 16–20 this year at Iowa State University. Seventy-two participants traveled from all corners of the United States and from seven countries to attend the five-day short course organized by Iowa State University Meat Science Extension.

Matt Wenger, coordinator of Iowa State's meat short courses, shares that this is, hands down, the most popular course offering in their program.

A great mix of participants attend the course, ranging from small producers to chefs, ingredient suppliers, and machinery designers and manufacturers, as well as a cross-section from some of the major U.S. meat companies.

The course is designed for people with supervisory, production, and technical responsibilities in commercial meat processing operations, explains Wenger. It also is open to those in marketing and supplier industries. "Since Iowa State started

its processed meat short course programs in 1979, more than 10,000 people have participated in one of our programs,” Wenger says.

It’s a course with an incredible pedigree. Iowa State has been the training ground for a few of the most illustrious producers. “Many years we have high-profile chefs attend the course,” says Wenger. “This year, four chefs from the renowned Besh Restaurant Group in New Orleans joined us.”

Sausage and Processed Meats Short Course

Enrollment for this course is intentionally limited so that participants have ample opportunities to interact with speakers and staff and have their questions answered. Iowa State University’s modern Meat Laboratory allows participants to observe demonstrations and gain hands-on experience with the latest technology.

Participants are divided into teams and, under the supervision of an instructor, formulate and prepare processed meat products. There were 23 instructors for the five-day event this year. Kreibig taught two classes, focusing on casings and specialty sausages.

Andrew Rigney, an account manager with Purac in Lincolnshire, Illinois, chose to attend this specific short course to gain insight on how sausage is made and the issues that may arise in production. “As an ingredient supplier to this segment of the business, it is crucial to understand what our customers are up against and how we may be able to offer solutions,” says Rigney. “This course was wonderful and really went through all aspects of both sausage and processed meats production. I will use this knowledge going forward as I work with my customers.”

The short course offers a great balance of theory and practice. It focuses on the technology of sausage production and other types of meat processing. Topics range from lectures on basic meat science to demonstrations of processing techniques. Speakers, nationally and internationally recognized authorities in their fields, provide information about the latest technology available.

Mickey Hall, an associate professor in the Department of Animal and Veterinary Sciences at Clemson University, enrolled in the course to get some ideas about sausage products for the meat processing and products course she recently started teaching. “This course gave me so many great ideas to share with my students and also allowed me to work with the best experts in academia as well as from industry,” says Hall.

“WurstFest was an incredible culmination to the workshop and allowed us to taste so many of the products that were made during the week.”

Iowa State has one of the most extensive programs in the nation for helping meat industry personnel comply with new food safety regulations and learn about the latest technology and meat science information. In 2004, in the only ranking ever done on meat science extension programs, *Meat and Poultry Magazine* ranked Iowa State’s program number one in the nation.



Top: Participants of Iowa State’s Meat Laboratory short course receive hands-on instruction from Klaus Kreibig.

Bottom: WurstFest showcases products made by participants of the Sausage and Processed Meats Short Course.

➤ **For more information about this course and other offerings by Iowa State University Meat Science Extension, contact Matt Wenger at 515-294-9279 or mwenger@iastate.edu.**

Size and Characteristics of Iowa's Construction Sector by Liesl Eathington

Construction activities contributed 3.2 percent of Iowa's total gross domestic product (GDP) in 2011. Prior to a slowdown that began in 2006, the construction sector had been averaging closer to 4 percent of Iowa's GDP since the mid-1990s.

Iowa had 102,230 total construction jobs in 2010. To put its size in perspective, the construction sector ranks slightly behind the finance and insurance sector in terms of total employment. Proprietors and partners account for 37 percent of Iowa's construction jobs, while wage and salary workers fill the rest. Iowa's average wage and salary construction worker earned \$43,700 in 2010.

Iowa's construction firms numbered approximately 35,500 in 2010. Most were small operations with no paid workers other than the proprietor or partners. These firms outnumbered larger establishments with employees on payroll by a ratio of three to one.

Two-thirds of Iowa's construction firms are specialty trades firms. These establishments are responsible for a portion of the project and perform specific activities such as pouring concrete, site preparation, plumbing, painting, and electrical work. Three percent of construction firms in Iowa are engaged in heavy and civil engineering construction such as highways and dams, dredging and land drainage, utility line installation, parks and trails, and other site-improvement activities. The remaining 30 percent of Iowa's construction firms are of the general contractor type, primarily engaged in the construction of residential, commercial, and industrial buildings.

Construction Sector Trends

Total building activity in the United States and Iowa reached a peak in 2005–2006, declined sharply from 2007 to 2010, and has remained flat since that time. Figure 1 illustrates trends in the dollar value of construction put in place in the United States from 2005 through 2011. Based on U.S. Census Bureau estimates, the real dollar value of construction work done in the United States during 2011 was 36 percent lower than in 2005. A 63 percent drop in private residential construction activity accounts for nearly the entire net decline.

Nonresidential building activity followed a different trend than residential activity, growing from 2005 through 2008 before dropping back to 2005 levels. Construction spending by the public sector remained relatively stable throughout the period. The value of public sector construction activity peaked in 2009, a year that included stimulus spending, and has settled back to 2005 levels since that time. By 2011, the private residential, private nonresidential, and public sector segments each

accounted for one-third of U.S. building activity.

Value of U.S. Construction Put in Place (In Millions of 2011 Dollars)

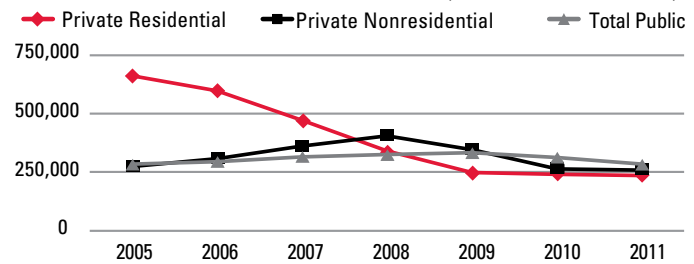


Figure 1

Similar data for Iowa are not available; however, trends in the number of new residential building permits suggest a similar pattern of decline in private residential construction activity. Iowa's permit-authorizing jurisdictions issued 7,526 permits for new, privately owned housing units in Iowa in 2011. This was less than half the number issued in 2005.

The sharp declines in building activity triggered losses in construction sector productivity and jobs. The United States suffered a 28 percent decline in real construction sector GDP from 2005 to 2011 and lost 22 percent of its construction jobs from 2006 to 2010. Iowa experienced a 16 percent decline in construction GDP and a 13 percent loss in construction jobs.

Recent data on wage and salary jobs suggest Iowa has experienced a slight rebound in construction employment since mid-2010. Figure 2 shows the trend in Iowa and U.S. wage and salary construction jobs by month, with preliminary estimates through June 2012.

Seasonally Adjusted Construction Jobs: Iowa and U.S.
(January 2002 = 100%)

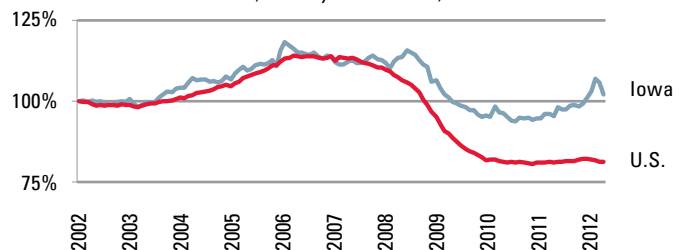


Figure 2

Multiple construction-related indicators, from building permits to employment to GDP, illustrate the severity of contraction in building activity in the United States since 2005. Iowa's construction sector followed a pattern of decline similar to, albeit less severe than, the U.S. average. Near-term recovery prospects will depend primarily on private residential and nonresidential demand, as public sector construction activity will likely be constrained by budgets.



LDJ Manufacturing received the Entrepreneur of the Month award from Iowa Farm Bureau's Renew Rural Iowa program. Pictured is Luke Van Wyk with a fuel and service trailer.

Manufacturing Plays Vital Role in Rural Communities

Manufacturers and small businesses are a vital part of the fabric of rural Iowa communities. They line main streets in small towns and they strengthen their community by providing job opportunities, diversifying the local economy, and expanding the tax base, thus keeping crucial public services intact and infrastructure strong.

CIRAS understands the importance of these businesses and offers customized solutions that enhance the performance of Iowa companies. This is best accomplished by combining in-house expertise with extensive resources found within partner organizations to create a stronger network of support.

The Iowa Farm Bureau Federation shares this vision and continues its commitment to invest in the growth of rural and small communities. With nearly 90 percent of Iowa's farmers working off-farm for supplemental income and health care benefits, the bureau recognizes the need for rural economic stability and is paving the way by bolstering existing businesses and fostering rural entrepreneurs.

In 2007, the Iowa Farm Bureau established the *Renew Rural Iowa* program. This innovative program combines mentoring and networking with access to rural vitality investment funds.

The goal of the program is not solely focused on job creation, but on expanding the number and size of hometown businesses in rural Iowa.



Sandy Ehrig, the economic development administrator at *Renew Rural Iowa*, enthusiastically shares the successes of the program. "We have made great strides in the last five years by supporting existing rural businesses and entrepreneurial start-ups," says Ehrig. "It takes more than a local facility and traditional financing to make a business successful. It takes many great resources coupled with community support to achieve true rural vitality."

Renew Rural Iowa signature platforms include the following:

Business Success Seminar—This free educational session provides the tools necessary to grow and improve a business. Upon completion of this seminar, participants are eligible to receive experienced mentoring that is customized to their business as well as connections to various sources of funding.

Continued on page 14

Roundtable Events—Representatives from key statewide resources and other stakeholders discuss how to collaborate and deliver services to further entrepreneurial development.

Rural Vitality Funds—Funds are available for qualified entrepreneurial projects that will contribute to new job creation, expansions, and growth in retail spending.

Leader Awards—Each month an entrepreneur is recognized for their success and impact on rural Iowa.

Recently, LDJ Manufacturing of Pella, a fuel and service trailer manufacturing business founded by Loren Van Wyk, received the *Renew Rural Iowa* entrepreneur of the month award, recognizing the company for its entrepreneurial innovation and job creation.

The Van Wyks credit many partners with their success, including the services provided by CIRAS. The company was nominated for the award by the Iowa Area Development Group and Pella Electric Cooperative, two businesses assisting with their current expansion.

Steve Devlin, a program director at CIRAS, understands that manufacturing in Iowa has its roots in the farming industry. “LDJ Manufacturing is a prime example of ideas generated from farming sparking new business opportunities,” explains Devlin. And Ehrig agrees, stating, “Agricultural manufacturing is an economic engine in rural Iowa.”

“Iowa’s manufacturing sector contributes the largest share of the state’s gross domestic product, provides good-paying jobs for families, and serves as the backbone of many communities,” says Devlin.

The *Renew Rural Iowa* program has reached several milestones in its first five years. More than 2,200 participants from all geographic regions of Iowa participated in Business Success seminars, and 46 companies were recognized with the Leader Award on WHO radio. The Rural Vitality Fund, managed by Dave Sengpiel at the Iowa Farm Bureau, has made investments in ten rural Iowa companies and has leveraged \$80 million in community economic impacts.

➤ **For more information about *Renew Rural Iowa*, contact Sandy Ehrig at 800-254-9670 or sehrig@ifbf.org, or visit www.renewruraliowa.com.**

- **Iowa Area Development Group Partners Forum**
November 1–2, 2012
8:00 a.m.–5:00 p.m.
West Des Moines, IA
 - **Iowa Farm Bureau Federation *Renew Rural Iowa* Business Success Seminar**
November 1, 2012
8:30 a.m.–4:30 p.m.
West Des Moines, IA
 - **Understanding and Managing Variable Frequency Drives in the Water and Wastewater Treatment Industry**
November 13, 2012
8:15 a.m.–12:15 p.m.
Des Moines, IA
 - **Theory of Constraints (TOC) Strategic Solutions—Part I**
February 5–7, 2013
8:00 a.m.–5:00 p.m.; ending at noon on 2/7/13
Ames, IA
 - **Theory of Constraints (TOC) Strategic Solutions—Part II**
February 19–21, 2013
8:00 a.m.–5:00 p.m.; ending at noon on 2/21/13
Ames, IA
- See the Events section of the CIRAS website, www.ciras.iastate.edu, for details.**

Wellness continued from page 6

counselors, to provide an overall wellness assessment. From those 60, 30 people will be selected to participate in a six-month worksite wellness program.

“We will tailor the program to what we learn in the survey, focus groups, and health risk appraisal stages of the project,” Litchfield explains. “The programs will include a lot of education but also will engage the participants in skill development as it relates to their financial and physical health. Each location will be unique; we might meet weekly or every other week. One group might want a walking club while another could be interested in subsidized health club memberships. We will work with administrators to see what is possible.”

Litchfield and Griesdorn will also collect data on such things as absenteeism and health insurance claims for both the research and control groups. “Even though this project is just for one year, we hope this demonstrates the effect wellness programs can have and motivates other companies to offer programs,” Litchfield says.

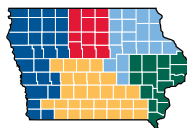
➤ **For more information, contact Mike O’Donnell at 515-294-1588 or modonnll@iastate.edu.**

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Iowa State University

Center for Crops Utilization Research
College of Engineering
Department of Environmental Health and Safety
Engineering Career Services

Engineering-LAS Online Learning
Industrial Assessment Center
Institute for Physical Research and Technology
Meat Science Extension

Des Moines Area Community College

Iowa Area Development Group
Iowa Association of Business and Industry
Iowa Business Council
Iowa Central Community College
Iowa Farm Bureau Federation
North Iowa Area Community College



NOTEWORTHY

Global Manufacturing Firms Focus More on Innovation

Global manufacturing companies "are in the early stages of major product innovation," according to a survey conducted by KPMG of 241 senior manufacturing executives in industries such as industrial products, metals, aerospace and defense, and multi-industry conglomerates. Given that growth continues to falter in a volatile global economy, manufacturers have embraced alliances with companies "to explore and commercialize their collective intellectual property and product development capabilities."

They are also being driven to form collaborative relationships with customers and suppliers early in the product development cycle. "A new wave of transformational innovation has begun, based on closer collaboration across the supply chain," according to the survey. Sixty-one percent of the manufacturers said they believe that "supply chain collaboration and transparency will make a significant or very significant contribution to their profits over the next 12 to 24 months."

Manufacturers continue to move their factories closer to their sources of supply and to end markets "not only to manage costs better but also to localize their product

offerings appropriately with greater speed, agility, and accuracy," says the survey. "Forty-six percent of respondents expect this trend of nearshoring to increase over the next 12 to 24 months."

Manufacturers continue to stress value-added services such as maintenance, performance optimizing, and product lifecycle management as a means to boost revenues. Sixty-three percent of respondents "expect new and enhanced consumer services to make a significant or very significant contribution to profits in the next 12 to 24 months."

After several years spent cutting costs, "many manufacturers realize that they must deploy capital to develop the products that could give them a competitive advantage," says Jeff Dobbs, head of the KPMG diversified industrial group upon release of the company's "2012 Global Manufacturing Outlook: Fostering Growth through Innovation."

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